

HEALTHY COASTAL ECOSYSTEMS FOR A HEALTHY ECONOMY

Coastal areas host some of the most ancient, complex and productive ecosystems on Earth. They possess the capacity to supply two-thirds of the world's seafood. Coral reefs, like tropical rainforests, support some of the most diverse assemblages of species on Earth—a vast source of potentially valuable biochemical products. Wetlands physically protect coastlines, and they also filter out nutrients and other pollutants that damage water quality and ecosystem health.

The United States' 95,000-mile coast ranks among the longest of any nation on Earth. Coastal areas provide essential habitat for fish and shellfish that make up 75 percent of U.S. commercial landings. Coastal ecosystems are also critical habitat for numerous species of recreational fishes, waterfowl, migratory birds, marine mammals and sea turtles. A healthy national economy depends on healthy coastal ecosystems.

More than half of the people in the U.S. live within 50 miles of the coast, and the coastal population continues to grow much faster than inland populations. This rapid urbanization of our coasts has destroyed a significant amount of coastal wetlands, degraded coastal water quality and severely stressed coastal ecosystems.

Sea Grant has a unique capability to bring the nation's best minds to bear on coastal habitat and ecosystem issues. It offers an integrated program of education, research and technical assistance that promotes the wise use of coastal resources. Sea Grant's interest in coastal ecosystems focuses on two broad areas:

- Minimizing the negative impacts of human-induced changes to coastal ecosystems, and
- Developing and implementing methods of restoring damaged coastal habitats.

Reducing stresses on coastal ecosystems

Excessive inputs of nutrients and toxic pollutants from the Mississippi River watershed are blamed for a 7,000-square-mile "Dead Zone" in the Gulf of Mexico. Dangerously high concentrations of nitrogen in coastal waters foster outbreaks of new waterborne pathogens. Wetland losses contribute to over-fertilization of coastal waters and the occurrence of harmful algal blooms (HABs).

Sea Grant has been a leader in research and outreach dealing with public health and economic impacts of *Pfiesteria*, brown tides and other HABs; the root causes of



the Gulf "Dead Zone"; the impacts of metropolitan sewage outflows on coastal waters; and the causes and effects of toxic chemical contamination of oysters, mussels and Great Lakes fish. Sea Grant's experience and expertise can make significant contributions toward resolving these and many other coastal ecosystem and public health issues nationwide.

Invasive species

A major threat to the health and survival of all coastal ecosystems arises from the introduction of exotic species via the ballast water of ocean-going ships; intentional and

accidental releases of aquaculture species, aquarium specimens or bait, and other means. Foreign invaders like the green crab, zebra mussel and Pacific jellyfish have displaced native species and diminished biodiversity, resulting in huge economic impacts and fundamental disruptions of coastal and Great Lakes ecosystems.

Sea Grant was among the first to respond to the zebra mussel invasion of the Great Lakes in the 1980s and the recent Pacific jellyfish invasion of the Gulf of Mexico. Sea Grant continues to respond with integrated, multi-state programs of research, outreach and education, and it has increased public awareness of the rising rate of "biopollution" by foreign species through conferences, information clearinghouses, newsletters and a comprehensive Web sites (www.sgnis.org).



Coastal watersheds

Human uses of land and water upland from the coast play major roles in determining the quality of coastal ecosystems and habitats. Effective management of coastal ecosystems requires a better understanding of the complex set of mechanisms and pathways by which upland activities influence coastal waters.

Sea Grant has developed integrated watershed approaches that engage researchers and coastal communities throughout the United States to pursue the common goal

of sustainable watersheds. Sea Grant develops science-based information needed to predict changes in coastal ecosystems and habitats arising from land and water use in watersheds. Sea Grant has developed innovative applications of remote sensing, Geographic Information Systems and other novel technologies needed for a comprehensive national system to monitor and predict impacts in coastal watersheds. Sea Grant has led the transfer of these technologies to local communities.

Conserving and restoring coastal habitats

Nearly half of the nation's coastal wetlands have been lost, and wetland losses in some states exceed 90 percent. Gulf Coast states possess the largest proportion of coastal wetlands remaining in the nation—totaling just 17,000 square miles—yet these areas are also disappearing rapidly due to coastal development. Beaches, dunes, seagrasses, coral reefs, oyster reefs and other valuable habitats face similar pressures. Loss and deterioration of coastal habitats, especially estuaries and wetlands, has dramatically affected U.S. fishery stocks. Landings of estuarine-dependent fishes are down, and the shellfishing industry is at historically low levels. Salmon in the Pacific Northwest have declined significantly due to alterations



to watershed habitat. In addition, the genetic diversity of many marine species is very low, increasing the probabilities of disease and extinction.

Identification of critical fish spawning grounds and nursery habitats represents a hallmark of Sea Grant research nationwide, work which provides vital information for the designation of future marine protected areas. Sea Grant scientists also have studied the effects of commercial fishing on coastal habitats and how to ameliorate the adverse impacts of dredging. Sea Grant empowers coastal communities to undertake well-planned coastal development that preserves and helps restore coastal habitats. Sea Grant partners with private and public entities to promote wetlands banking, rehabilitate brownfields, stabilize and restore beaches, establish marine protected areas and use dredged materials to enhance fish and wildlife habitat. Sea Grant can contribute substan-

tially to implementing the Coastal Wetland Planning, Protection & Restoration Act, the Coastal Zone Management Act and the Estuarine Restoration Act, as well as other vital coastal conservation and management legislation.

Building on a legacy of success

Through its unique integration of research, education and outreach, Sea Grant has built an enviable record of success in providing policy-makers and the public with valuable science-based information for conserving and restoring critical coastal ecosystems. Through its established relationship with more than 3,000 faculty, staff and students at over 300 universities nationwide, Sea Grant is exceptionally qualified to lead an expanded national effort that brings academia, government and the private sector together to protect and restore America's critical coastal ecosystems and habitats.

The Sea Grant program possesses a demonstrated capability to reduce the impacts of human-induced change on the structure and function of coastal ecosystems and to restore these critical habitats for future generations of Americans.



Mission

The Ecosystems and Habitats Theme identifies priority actions to sustain and renew America's coastal and Great Lakes ecosystems and habitats for this and future generations. Sea Grant is uniquely positioned to draw upon the talents and expertise of researchers, educators and outreach specialists at more than 300 U.S. universities to identify the highest priority research, education and extension needs for an expanded national effort in coastal ecosystems and habitats, and to transfer these findings to coastal stakeholders.

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